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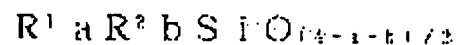
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(54) ELECTRICALLY CONDUCTIVE SILICONE RUBBER COMPOSITION FOR USE IN ROLL

(57)Abstract:

PURPOSE: To provide the subject composition of low tack, good in processability, small in the variation of volume resistivity, comprising an unsaturated group- contg. organopolysiloxane, inorganic filler, electrically conductive carbon black, spherical silicone rubber powder, and curing agent.

CONSTITUTION: The objective silicone rubber composition comprises (A) 100 pts.wt. of an organopolysiloxane having in one molecule at least two siloxane units of the formula (R1 is monovalent hydrocarbon free from aliphatic unsaturated bond; R2 is alkenyl; (a) is 0-2; (b) is 1-2; (a+b)=1.95 to 2.10) (e.g. dimethylpolysiloxane bearing dimethylvinylsiloxy groups at both terminals), (B) 5-100 pts.wt. of an inorganic filler treated with a surfactant (e.g. silica), (C) 5-50 pts.wt. of electrically conductive carbon black, (D) 15-200 pts.wt. of spherical silicone rubber powder of 5-30 μ m mean particle diameter, and (E) a curing agent (e.g. chloroplatinic acid).



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Adhesiveness of this invention is small before hardening in detail about the conductive silicone rubber constituent for a roll, and after hardening is excellent in workability, such as polish nature, and is related with the conductive silicone rubber constituent for a roll with which dispersion in a volume resistivity value can serve as [surface adhesiveness] small silicone rubber mold goods small.

[0002]

[Description of the Prior Art] Since environmental stability, compression set-proof nature, etc. are excellent, silicone rubber is used as covering material of the roll of a copying machine, facsimile, a printer, etc. Also in them, conductive carbon black is contained in the electrification roll currently used for a contact process developer, a development roll, and a transfer roller, and the silicone rubber constituent which can become the silicone rubber mold goods in the electric conduction field whose volume resistivity value it is a low degree of hardness after hardening, and is 104 - 1010 ohm-cm extent is used for them. However, the roll covering material fabricated from these silicone rubber constituents is a method of **** at what adhesiveness is large, and it is difficult to make surface roughness small by grinding the front face, and can not necessarily be satisfied. That is, since such roll covering material shows the toner conveyance nature by which was hard to fix the toner whose thing in which granularity has a small front face small is a developer on the front face, and adhesiveness was stabilized, it is made desirable. However, it is the constituent which carried out addition combination of the conductive carbon black, and in order to manufacture the silicone rubber constituent which can become the silicone rubber mold goods of a low degree of hardness after hardening, there are few loadings of a reinforcement nature bulking agent, and it is necessary to consider as the constituent with which crosslinking density becomes low, and inevitably, adhesiveness becomes large and, as for the roll covering material fabricated from such a constituent, the polish nature also worsens. Moreover, before hardening, such a silicone rubber constituent had large adhesiveness, it was faced kneading this with 2 rolls etc., and troubles -- it is hard to do a roll activity -- were also.

[0003]

[Problem(s) to be Solved by the Invention] this invention persons reached this invention, as a result of inquiring wholeheartedly that the above-mentioned trouble should be canceled. Adhesiveness is small before hardening, the object of this invention is excellent in roll workability, after hardening is excellent in workability, such as polish nature, and surface adhesiveness is to offer the conductive silicone rubber constituent for a roll with which dispersion in a volume resistivity value can serve as small roll covering material small.

[0004]

[Means for Solving the Problem and its Function] This this invention is (A) general formula $R_1aR_2bSiO_{(4-a-b)/2}$ (among a formula). for the monovalent hydrocarbon radical in which R1 does not have an aliphatic series unsaturated bond, and R2, an alkenyl radical and a are [the number of 1-2 and a+b of the number of 0-2 and b] the number of 1.95-2.10. The organopolysiloxane which has the siloxane unit expressed in [at least two] 1 molecule The 100 weight sections, the minerals bulking agent processed with the (B) surfactant The 5 - 100 weight section, (C) conductivity carbon black 5 - 50 weight section, the spherical silicone rubber fine particles whose (D) mean particle diameter is 0.5-30 micrometers The 15 - 200 weight section and (E) curing agent It is related with the conductive silicone rubber constituent for a roll which consists of sufficient amount to stiffen this constituent.

[0005] If this is explained, into 1 molecule, the (A) component used by this invention will be

organopolysiloxane which has at least two or more alkenyl radicals, and will serve as base resin of this invention. The aryl group as which the inside of the formula which this described above, and R1 are illustrated by the methyl group, the ethyl group, the alkyl group; phenyl group illustrated by the propyl group, and the tolyl group; it is the permutation alkyl group illustrated by 3, 3, and 3-triphenylpropyl group and 3-chloropropyl radical, and R2 is an alkenyl radical illustrated by the vinyl group, the allyl group, a propenyl radical, etc. And a is 0-2, b is 1-2, and a+b is within the limits of 1.95-2.10. Moreover, the molecular structure may be any of the shape of a straight chain, and the shape of a straight chain containing branching. There is no molecular weight of this component and it can use especially definition to what presents the shape of hyperviscous crude rubber from what presents the shape of liquid of hypoviscosity.

[0006] (B) The minerals bulking agent processed with the surfactant of a component is a component which serves to stabilize the volume resistivity value of this invention constituent. Although it is conventionally well-known and there is especially no definition well as a surface active agent, a cation system surface active agent is desirable here. As a minerals bulking agent, although silica impalpable powder; silicious marls, such as a wet method silica and a dry-process silica, an alumina, etc. are mentioned, silica impalpable powder is desirable. As an approach of obtaining this component, there are an approach of heat-treating, a method of drying after mixing the water solution of a minerals bulking agent and a surfactant, and removing moisture, etc. after mixing a minerals bulking agent and a surfactant to homogeneity. Moreover, the throughput of a surfactant has desirable 0.05 - 10 weight section to the minerals bulking agent 100 weight section.

[0007] (C) The conductive carbon black of a component is a component which gives conductivity to this invention constituent; it is used as an electro-conductivity applying agent of a common silicone rubber constituent, and there is especially no definition well. Acetylene black, FAANESUTOBUAKKU thermal black, etc. are raised as such carbon black. Also in these, the thing of 50-150 within the limits has desirable oil absorption.

[0008] The silicone rubber fine particles of the (D) component used by this invention are components by which this constituent is characterized, and serve to give the property that adhesiveness becomes small to the constituent of this invention, and to give workability, such as polish nature. Compared with the minerals bulking agent currently used as a bulking agent of the usual silicone rubber constituent, even if these silicone rubber fine particles carry out high restoration, there is dramatically little lifting of the degree of hardness of silicone rubber mold goods. Therefore, it is thought that it serves for the adhesiveness of the front face of silicone rubber mold goods to become small, and to raise rubber workability, such as polish nature and roll workability. The particle diameter of such silicone rubber fine particles is within the limits of 0.5-300 micrometers. Moreover, the configuration needs to be spherical. Such silicone rubber fine particles distribute the approach (refer to JP,63-17959,A and JP,63-77942,A) and the liquefied condensation reaction mold silicone rubber constituent which the addition reaction mold silicone rubber constituent of the shape for example, of liquid is sprayed [constituent] into heat, and stiffen it as a discontinuous phase in the water containing water or a surfactant, and they are manufactured by the approach (refer to JP,63-202658,A) of removing moisture at the same time it sprays into heating or heat and stiffens silicone rubber. Although the method of grinding mechanically the silicone rubber hardened besides the above, and obtaining silicone rubber fine particles is also learned, since surface adhesiveness and surface polish nature do not improve so much but especially dispersion of these properties becomes large, the silicone rubber mold goods with which the configuration of a particle of the silicone rubber fine particles obtained by this approach is non-**, and mean particle diameter is 100 micrometers or more, and generally comes to blend these silicone rubber fine particles are not desirable. The loadings of this component are the 15 - 200 weight section to the (A) component 100 weight section, and are the 20 - 150 weight section preferably.

[0009] (E) The curing agent of a component is a component for hardening this invention constituent, and organic peroxide is usually used. Moreover, concomitant use with the ORGANO hydrogen polysiloxane and a platinum system compound catalyst is also used. Although the loadings of this component are sufficient amount to stiffen this invention constituent Usually, it is [as opposed to / **** / organic-acid-peroxide / the (A) component 100 weight section] 0.1 - 10 weight section. About the concomitant use system of the ORGANO hydrogen polysiloxane and a platinum system compound catalyst, the amount of the ORGANO hydrogen polysiloxane receives the (A) component 100 weight section. Usually, it is 0.5 - 20 weight section, and the amount of a platinum system compound catalyst is within the limits of the 0.1 - 100 weight section to the (A) component 1 million weight section.

[0010] Although the constituent of this invention is easily manufactured by only mixing the above mentioned (A) component - (E) component to homogeneity, it does not interfere, even if it carries out addition combination of the various additives, such as a well-known heat-resistant agent, a flame retarder, and an adhesion grant agent, conventionally, unless the object of this invention is spoiled to this.

[0011]

[Example] Next, an example explains this invention. There is the weight section among an example with the section, and viscosity is a value in 25 degrees C.

[0012]

[Example 1] In the dimethylpolysiloxane (vinyl group content 0.5 % of the weight) 100 section of the 500 centipoise viscosity by which chain both ends were blocked by the dimethyl vinyl siloxy radical, chain both ends added the methyl-hydrogen-polysiloxane (content of silicon atomic union hydrogen atom 1.5 % of the weight) 6 section of the 10 centipoise viscosity blocked by the trimethylsiloxy radical, and were mixed, and Mixture a was obtained. Next, the isopropyl alcohol solution (3 % of the weight of platinum contents) 0.6 section of chloroplatinic acid was added to the dimethylpolysiloxane 100 same section as the above, it mixed, and Mixture b was obtained. Ion exchange water and a surfactant were added for what mixed this Mixture a and Mixture b so that it might be respectively set to 1 to 1 by the weight ratio to delivery and coincidence to the colloid mill, and the water dispersion of a silicone rubber constituent was obtained. While spraying the water dispersion of this silicone rubber constituent into the spray dryer set as 200 degrees C and stiffening the silicone rubber constituent, water was removed and spherical silicone rubber fine particles with a mean particle diameter of 10 micrometers were obtained.

[0013] Next, the wet method silica 10 section of 130m² of BET specific surface areas / g, the stearyl chloride trimethyl ammonium surfactant 10 section, and the water 100 section were mixed, this mixture is sprayed into the spray dryer set as 200 degrees C, and was dried, and the wet method silica by which surface treatment was carried out with the surfactant was obtained.

[0014] Homogeneity mixing of the dimethylpolysiloxane crude-rubber 100 section of the average degree of polymerization 3000 which serves as the wet method silica 15 section, the oil absorption (DBP) of 80mg / furnace black 25 100g section by which surface treatment was carried out with the surfactant obtained above from 99.84 mol % of dimethylsiloxane units and 0.16 mol % of methylvinyl siloxane units was carried out with the kneader mixer, and the silicone rubber base was obtained. It added in the amount which shows the spherical silicone rubber fine particles obtained above by this silicone rubber base 100 section in the table 1 which carries out a postscript, the 2 and 5 dimethyl bis(2 and 5-tert-butyl peroxide) hexane 1.0 section was added simultaneously, homogeneity mixing was carried out with 2 rolls, and the conductive silicone rubber constituents 1-3 for a roll were prepared. Press forming of these constituents 1-3 was carried out for 10 minutes under the temperature of 170 degrees C, and conditions with a pressure of 25kg/cm², and five sheet-like mold goods with a thickness of 2mm were obtained. Next, these constituents 1-3 were twisted on roll rodding made from stainless steel with a diameter [ϕ] of 5mm, vulcanization adhesion was carried out for 10 minutes at the temperature of 170 degrees C, and the silicone rubber coat roll with a diameter [ϕ] of 15mm was obtained. The silicone rubber sheet obtained above and the silicone rubber coat roll were put in into the hot blast circuit system oven set as 200 degrees C, and were left for 4 hours. Polish processing of it was carried out until the silicone rubber coat roll with a diameter [this / ϕ] of 15mm became the diameter ϕ of 14mm with the cylindrical grinder. Subsequently, the granularity of the front face of this silicone rubber coat roll was measured. These measurement results were shown in a table 2. Moreover, in order to check dispersion in the volume resistivity value of the obtained sheet-like mold goods, the volume resistivity value was measured. These measurement results were shown in the table 2 which carries out a postscript.

[0015]

[The examples 1-2 of a comparison] In the example 1, the silicone rubber sheet and the silicone rubber coat roll were fabricated like the example 1 except having made the addition of silicone rubber fine particles into the ten sections (example 1 of a comparison). Moreover, the silicone rubber sheet and the silicone rubber coat roll were fabricated like the example 1 except having not added silicone rubber fine particles in the example 1 (example 2 of a comparison). The property of these silicone rubber sheets and a silicone rubber coat roll was measured like the example 1. These results were written together to a table 1 and a table 2.

[0016]

[A table 1]

区 分 組 成	本 発 明			比 較 例	
	組成物 1	組成物 2	組成物 3	組成物 4	組成物 5
シリコンゴムペース(部)	1 4 0	1 4 0	1 4 0	1 4 0	1 4 0
シリコンゴム粉体(部)	2 0	5 0	1 5 0	1 0	0

[0017]

[A table 2]

区 分 測定値	本 発 明			比 較 例	
	組成物 1	組成物 2	組成物 3	組成物 4	組成物 5
体積固有抵抗値 のばらつき範囲 ($\Omega \cdot \text{cm}$)	1×10^7 ~ 3×10^7	1×10^7 ~ 2×10^7	1×10^7 ~ 2×10^7	1×10^7 ~ 3×10^7	1×10^7 ~ 2×10^7
ロール表面の粗さ Rz (μm)	5	3	3	1 0	1 3
かたさ J I S A	3 8	3 7	3 6	3 8	3 8
2本ロール混練 粘着性	○	◎	◎	△	×

○ Adhesiveness was not accepted but roll workability was very good.

○ Adhesiveness was small and roll workability was good.

** adhesiveness was accepted and roll workability was bad.

x Adhesiveness was large and roll workability was dramatically bad.

[0018]

[Effect of the Invention] The conductive silicone rubber constituent for a roll of this invention consists of a (A) component - (E) component. Since the mean particle diameter of the minerals bulking agent especially processed with the surfactant of the (B) component and the (D) component contains the silicone rubber fine particles which are 0.5-30 micrometers It has the description of having the volume resistivity value by which

was small before hardening, was excellent in roll workability, excelled [after / hardening] in workability, such as polish nature, and was excellent in surface adhesiveness, and dispersion was stabilized small. [of adhesiveness]

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] (A) general formula $R_1aR_2bSiO_{(4-a-b)/2}$ (the monovalent hydrocarbon radical in which R1 does not have an aliphatic series unsaturated bond among a formula --) for R2, an alkenyl radical and a are [the number of 1-2 and a+b of the number of 0-2 and b] the number of 1.95-2.10. The organopolysiloxane which has the siloxane unit expressed in [at least two] 1 molecule The 100 weight sections, the minerals bulking agent processed with the (B) surfactant The 5 - 100 weight section, (C) conductivity carbon black 5 - 50 weight section, the spherical silicone rubber fine particles whose (D) mean particle diameter is 0.5-30 micrometers 15 - 200 weight section and (E) curing agent Conductive silicone rubber constituent for a roll which consists of sufficient amount to stiffen this constituent.

[Claim 2] (B) The conductive silicone rubber constituent for a roll according to claim 1 whose minerals bulking agent processed with the surface active agent of a component is the silica impalpable powder processed with the cation system surface active agent.

[Translation done.]